

20081579-022200 6/25/2008

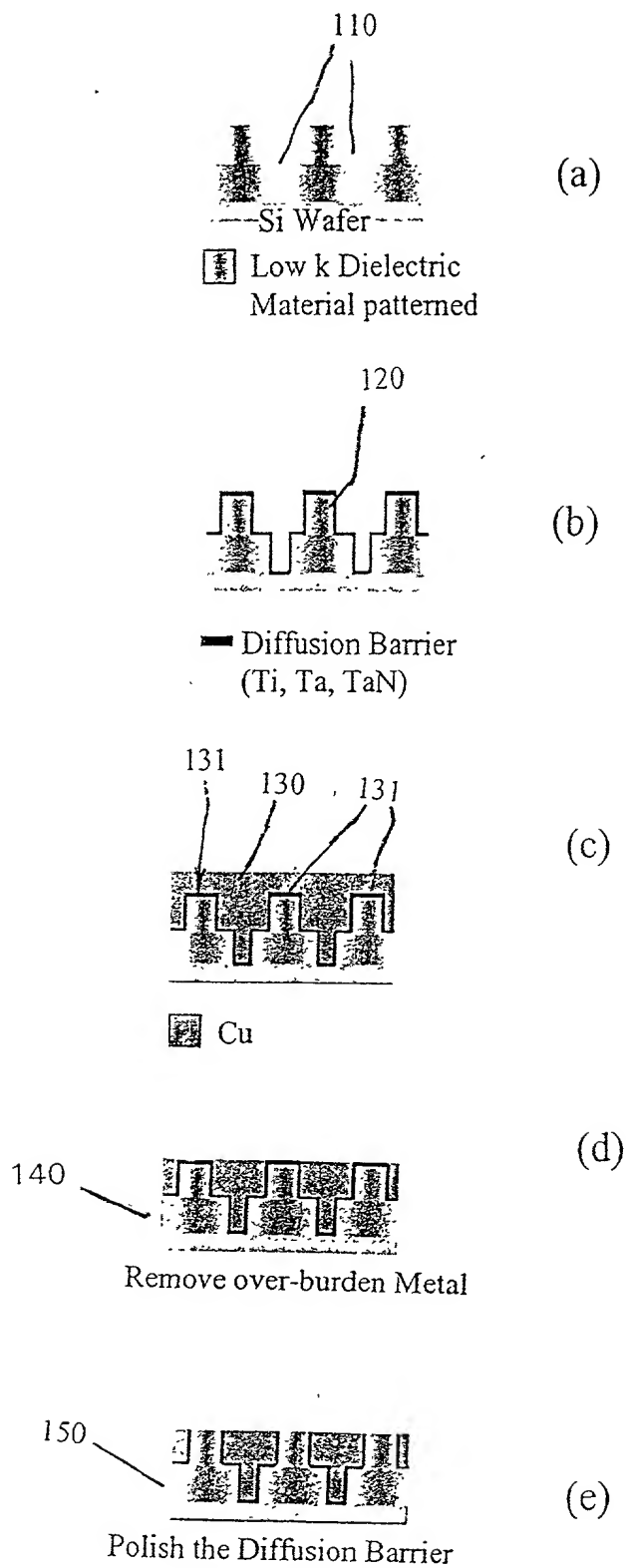


FIG. 1

200

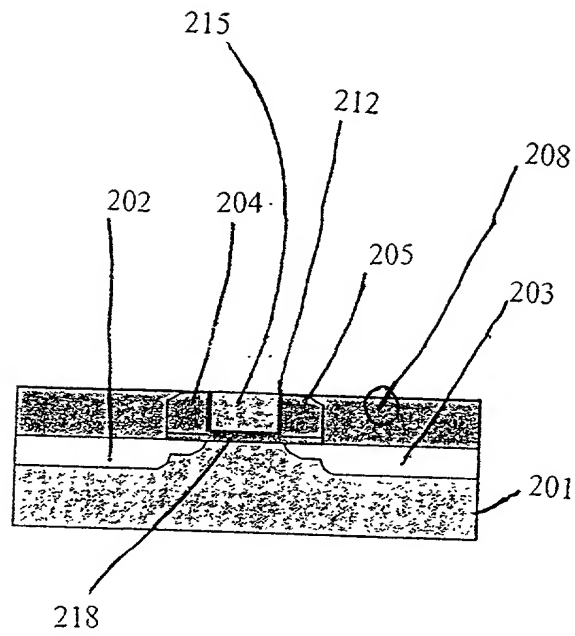


FIG. 2

300

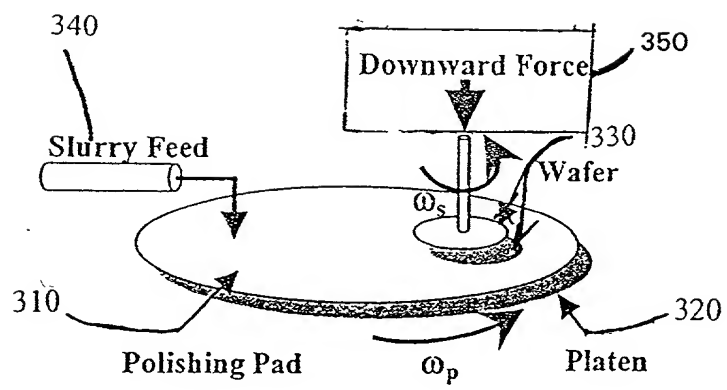


FIG. 3

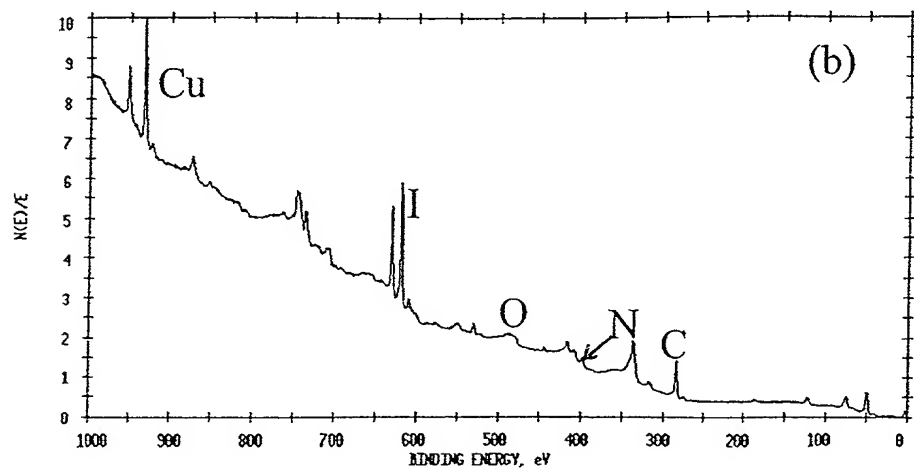
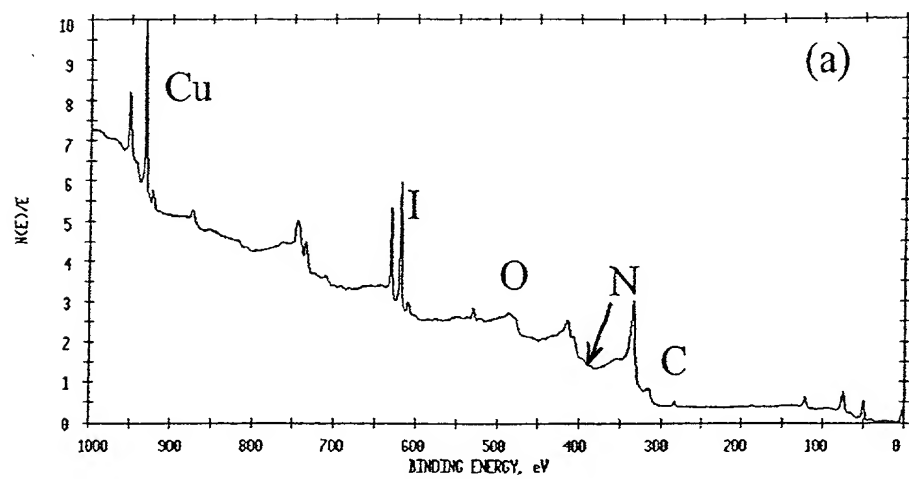


FIG. 4

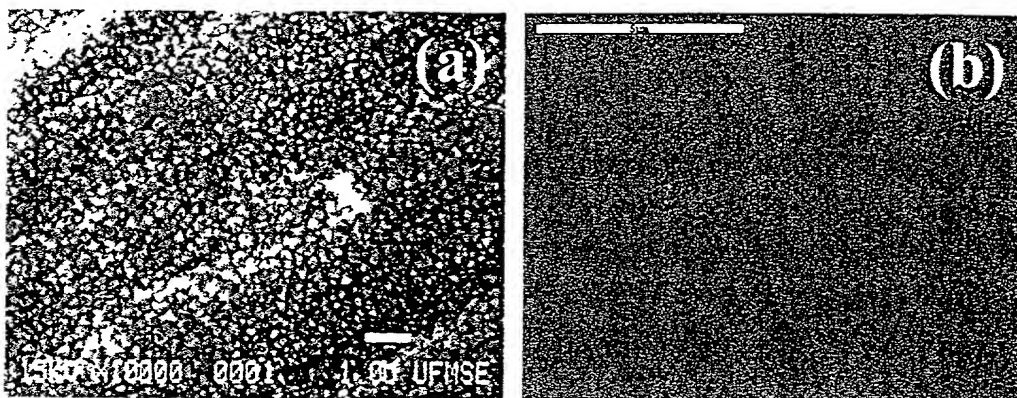


FIG. 5

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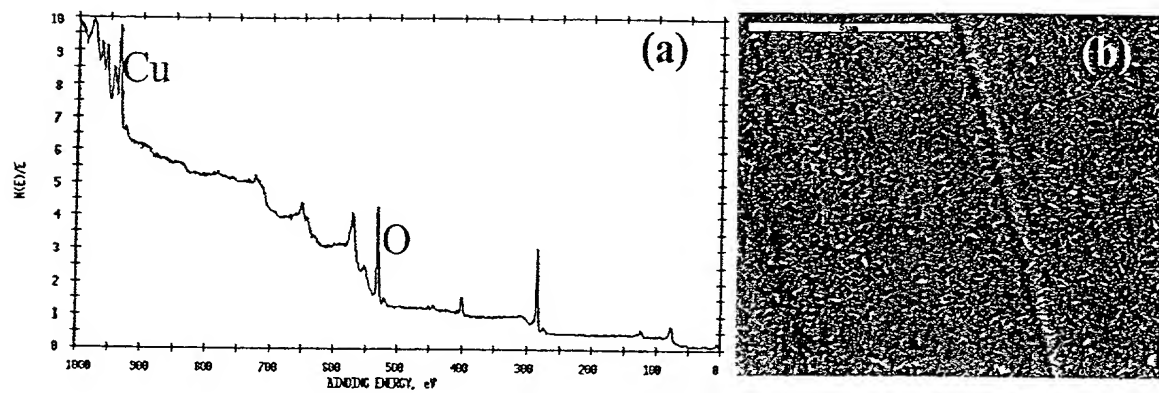


FIG. 6

| | Concentration of iodine (N) | | |
|-----------------------------|-----------------------------|-------|-------|
| | 0.001 | 0.01 | 0.1 |
| Removal Rate (nm/min) | 53 | 775.0 | 2716 |
| Selectivity with Cu/Ta | 530 | >4500 | >5000 |
| RMS (nm) | 1.06 | 1.98 | 2.13 |
| Scratches #/cm ² | <5 | <5 | <5 |

FIG. 7

| | Concentration of Hydrogen Peroxide (%) | | |
|-----------------------|--|-----|-----|
| | 0.1% | 1% | 10% |
| Removal Rate (nm/min) | 5 | 27 | 6 |
| RMS (nm) | 4.2 | 5.1 | - |

FIG. 8

| Pressure | 2.7 psi | 4.3 psi | 6.7 psi |
|-------------------------------|---------|---------|---------|
| Removal Rate (nm/min) | 298 | 335 | 425 |
| Selectivity Cu/Ta | > 3000 | > 3000 | > 3000 |
| Surface Roughness (nm) | 1.06 | 1.4 | 2.0 |
| Scratches (#cm ²) | < 5 | < 5 | < 5 |

FIG. 9

| | 0.01 N iodine | | | | |
|-----------------------|---------------|--------|--------|--------|-------|
| | pH 4 | pH 6 | pH 8 | pH 10 | pH 12 |
| Removal Rate (nm/min) | 1210 | 909 | 1023 | 756 | 23 |
| Selectivity (Ta) | 4000 | > 4000 | > 4000 | > 3000 | > 200 |

FIG. 10

| | Concentration of Particles | | |
|-----------------------|----------------------------|---------|---------|
| | No particle | 1 wt. % | 5 wt. % |
| Removal Rate (nm/min) | 71 | 114 | 151 |
| Selectivity | > 1000 | > 200 | > 200 |

FIG. 11

Effect of small amount of silica in iodine based solution

| | Concentration of silica particle | | | |
|--------------------------------|----------------------------------|------------|-----------|--------|
| | No particle | 0.01 wt. % | 0.1 wt. % | 1 wt % |
| Removal Rate (nm/min) | 50.4 | 80.2 | 153.6 | 333.5 |
| Selectivity on Cu/Ta | 7200 | 529 | 13 | 8.0 |
| Scratches (#/cm ²) | 0 | 0 | 1-2 | 5 |

FIG. 12

The effect of inhibitors in iodine solution (pH 4 and 2.7 psi)

| | 0.01 N I ₂ | | | | | | |
|-----------------------|-----------------------|-------|------|-------|-------|-------|-------|
| | No inhibitor | BTA | | | TTA | | |
| | | 1 mM | 5 mM | 10 mM | 1 mM | 5 mM | 10 mM |
| Removal Rate (nm/min) | 775.0 | 945.1 | 56.3 | 58.4 | 100.1 | 106.9 | 51.8 |
| STD | 7.6 | 14.9 | 16.6 | 16.2 | 27.2 | 13.2 | 7.3 |

The effect of surfactants on removal rate (nm/min) of copper in iodine solution (pH 4 and 6.7 psi)

| | 10 mM I ₂ | | | | | | | | | |
|-------------|----------------------|--------|--------|-------|-------|-------|--------------|-------|-------|------|
| | No inhibitor | SAS | | | | | Triton X-100 | | | |
| | | .5 mM | 2 mM | 5 mM | 10mM | 20 mM | 1 mM | 2 mM | 3 mM | 5 mM |
| RR (nm/min) | 1210.0 | 1080.9 | 1040.0 | 975.7 | 524.7 | 514.0 | 977.5 | 189.0 | 129.7 | 29.5 |
| STD | 33.5 | 55.1 | 11.6 | 62.5 | 34.1 | 11.5 | 43.4 | 30.4 | 21.2 | 24.2 |

The static removal rate (nm/min) of copper in iodine based solutions (pH 4)

| | | 10 mM iodine | | |
|----|---|--------------|------------|-------------|
| | | No additive | 5 mM BTA | 10 mM SAS |
| pH | 4 | 64.9 ± 2.65 | 2.8 ± 0.4 | 39.6 ± 4.3 |
| | 6 | 63.4 ± 2.37 | 1.1 ± 0.4 | 65.2 ± 10.1 |
| | 8 | 48.7 ± 2.4 | -1.4 ± 0.7 | 28.9 ± 0.4 |
| | 9 | 35.2 ± 1.3 | -0.3 ± 0.5 | 27.7 ± 0.4 |

FIG. 13

| | 0.01 N I ₂ , 10 mM TTA | | | | |
|-----------------------|-----------------------------------|---------|--------|--------------------|-------|
| | No salt | KI | | NH ₄ Cl | |
| | | 0.001 M | 0.01 M | 0.01 M | 0.1 M |
| Removal Rate (nm/min) | 52 | 66 | 92 | 34 | 32 |

FIG. 14

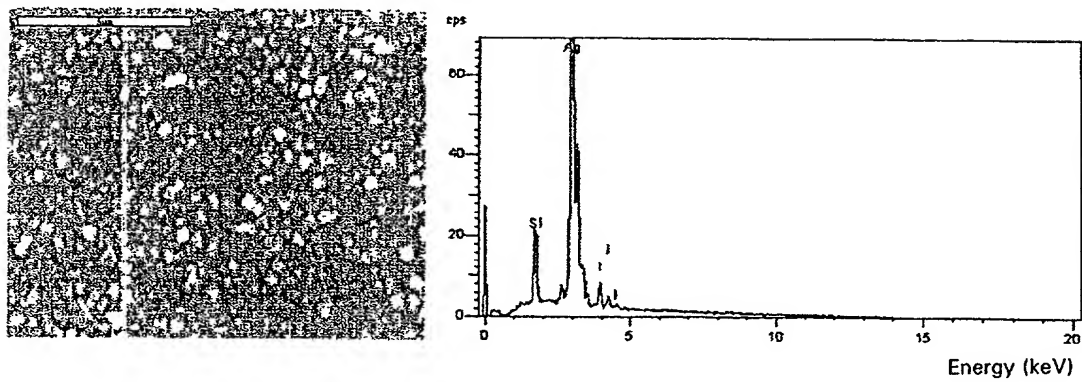
Effect of succinic acid/citric acid added in 10 mN Iodine and 5 mM BTA/TTA on CMP performance

| | 10 ⁻² N I ₂ , 5 mM BTA | | 10 ⁻² N I ₂ , 5 mM TTA | | 10 ⁻² N I ₂ , 5 mM BTA | |
|-----------------------|--|-------|--|------|--|-------|
| | Succinic Acid | | Succinic Acid | | Citric Acid | |
| | 0.1 M | 0.2 M | 0.1 M | 0.2M | 0.1 M | 0.2 M |
| Removal Rate (nm/min) | 33.5 | 37.4 | 36.6 | 47.0 | 295.1 | 432.5 |
| STD | 12.5 | 1.9 | 10.9 | 6.1 | 26.6 | 5.0 |
| SRR (nm/min) | 3.2 | 3.9 | 2.7 | 3.1 | 11.7 | 18.3 |

FIG. 15

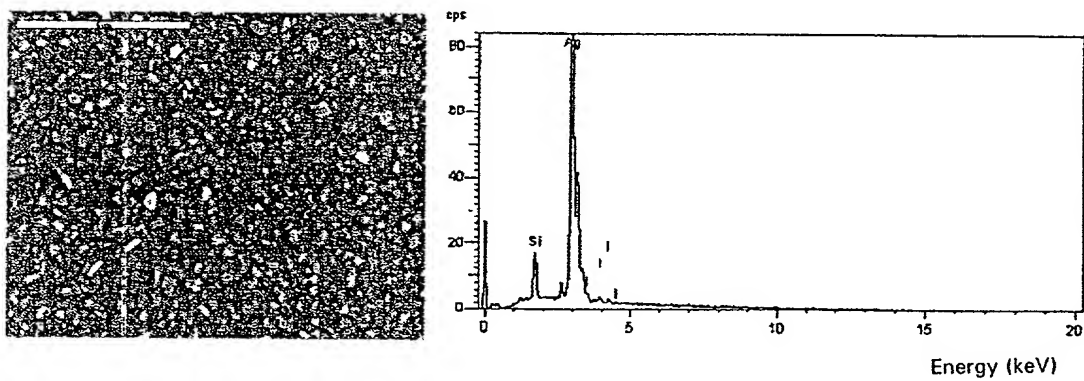
SEM (x10k) pictures and EDS of AgI

Slurry chemistry: 10 mN iodine at pH4



(a)

Slurry Chemistry: 10 mN iodine and 20 mM BTA at pH 4



(b)

FIG. 16